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ABSTRACT

This literature review contains a general description of the international experience with team teaching, the specific results of team teaching in mathematics, a brief evaluation of empirical research on team teaching, and some remarks on action research. The following conclusions are drawn: (1) team teaching is insufficient as a mere organizational method and must be linked to a comprehensive pedagogic conception in order to be successful; (2) there is no clear superiority nor inferiority of team teaching in achievement changes in any particular subject; (3) the experience of team teaching is best in interdisciplinary projects; and (4) the research on team teaching has not yet given a definite answer to the question of what teaching units can be taught in what form by what teaching team. (MP)

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What research has found out on the cooperation of teachers and the effect of team teaching

I. Introduction

At school any single teacher is subject to a couple of restrictive conditions he has to comply and work with. The most important of them are

- size and composition of the class
- curricula and educational instructions
- arrangement and allocations of rooms
- number of students instructed in one class
- number of lessons for teacher and student (in most countries they are the same for all pupils)
- timing and length of lessons
- syllabi for examinations [2)].

In schools that are organized in the traditional manner the individual teacher has to solve all his problems by himself, arranging his instruction according to the restrictions mentioned above. He has hardly any possibilities to modify the frame conditions.

The traditional pattern of schooling results in a one-teacher-one-class relationship. This system usually implies either universal teaching, in which one teacher will teach all subjects to one class, or the discipline teacher system. This being so, there is no need for any coordination going

1) The author is indebted Volker Meier and Rudolf Sträßer for their comments on an earlier draft of this paper.

2) Of course there are national differences, i.e. in USA and the FRG the central administrative instructions have to be observed very strictly whereas in some Scandinavian countries (Denmark for example) teachers have more liberty (compare NISSEN and TESCHNER 1978).

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beyond the agreement stating which class will be instructed by which teacher in which subject, in which room and at which hours.

For various reasons (at school) alternatives are considered to end the isolation of the teacher in preparing and managing his instruction. This paper will try to give a critical summary of experiences that have been made with team-teaching (TT), as well as a general survey and an evaluation of the empirical research work.

Very often the idea of TT has been reduced to the very literal sense of the word. The variety of descriptions as well as the definitions and principles that TT has been identified with have given rise to numerous standings and prejudiced opinions and have furthermore provided the soil for polemic misinterpretations. Yet on the other hand, this may also be taken as an explanation for the fact that TT has being used as a vogue word.

If one for example compares the definition of the National Education Association (NEA):

1) "TT is a plan whereby two or more teachers are jointly responsible for the instruction of the same group of pupils" (NEA 1962, p. 59)

with the definition given by WARWICK:

2) TT is "a form of organisation in which individual teachers decide to pool resources, interest and expertise in order to devise and implement a scheme of work suitable to the needs of their pupils and the facilities of their school" (WARWICK 1971, p. 18)

one may gain a first impression - even without any detailed knowledge of the discussion about TT - of the manifold ideas and aims that are connected with TT. In definition 1 which sounds more technological and which is concerned with the administrative level as well as in definition 2, which focusses on the teacher and the student and their

needs, the following forms of TT may be formally distinguished [3] (WINKEL 1972, p. 15ff)

- discipline TT
- interdisciplinary TT
- occasional TT.

As a fourth form WINKEL mentions the 'school-within-school' team in which all teachers of one school are gathered in a team.

Neither the form of interdisciplinary TT nor that of the school-within-school TT implies that traditional boundaries of different subjects are abolished. Even if one has a purely additive instruction of unrelated subject matters, TT can be practised. In each of these types, teams can be organized either hierarchically (vertically) or non-hierarchically (horizontally).

Since the actual performance of TT is above all determined by national pedagogic traditions, by the economic background and by national educational problems, which differ considerably from country to country, I arrange the discussion in a way, that different countries which practise TT are dealt with separately.

In literature on TT, TT is frequently seen in connection with the problem of differentiation and project-oriented instruction. Often TT is a form of teaching that is chosen for pragmatical reasons - merely a means of differentiating various types of groups - i.e. when one teacher 'repeats'

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[3] In literature several classifications are made, i.e. "intensity of the interdependence with the team" (COHEN 1976) or TT-experience of the team (HALL and RUTHERFORD 1976); the classification given in the text is the most common one.

given lessons while a collegue works with small groups. Also for project instruction TT often is a necessity caused by the teacher's limited competence and the needs of the project itself. But we must emphasize that even interdisciplinary TT is not identical with project oriented instruction. Testing of knowledge by application, learning by problem solving, out-of-school-learning are characteristics of project instruction (BONN 1975, p. 470f) which do not emerge in TT necessarily.

In the following discussion the particular effects on special subject instruction are not worked out in detail. This only mirrors literature on and practise of TT which does not differentiate between subjects. But the few results which have been found out about mathematical instruction will be discussed in detail.

As a matter of fact innovations in the way of instruction result in changes of school structures. This paper intends focus on two essential aspects which have been discussed and examined in connection with the introduction of TT. The first point, which will be given special treatment is the question of whether students' achievement is improved by the application of TT. There has been a vehement controversy on this subject for some time. Secondly, changes in the teacher's role in TT will be dealt with and a summary of the most important findings will be given.

II. Experience with TT and empirical research work

1.1 TT in the USA

The "old-fashioned" model of cooperation and communication at school was critized in the USA above all by the Progressive Education Association (PEA). Certainly the intellectual roots of the theoretical recommenders and fathers of TT in the USA are stem from progressive education established by J. DEWEY and H. PARKHURST. However, it is

impossible to understand the genesis and increasing importance of TT during the 50ies without considering certain aspects contradictory to "progressive education". In his splendid book about TT WINKEL (1974) enumerates 10 factors of influence which are responsible for the development of TT in the USA: termination of teachers-shortage, creation of promotion possibilities, rising of teachers' salaries, efficiency of teacher distribution, improvement of in-service training, improvement of teachers' qualifications, improvement of teaching and learners achievement, offering possibilities of flexible scheduling and lastly some general pedagogical motives.

The defects in the American school system led to a precarious situation in the 50ies with more than 100,000 teachers missing, the teacher's income falling below the average income and about 11 percent of all American teachers leaving their job every year (WINKEL 1974, p. 60ff). This led to a permanent decrease of teachers' average qualifications, as the higher qualified teachers usually tried to find better alternatives outside school. So the following situation was created (cf. MORSE 1960, p. 161). "About 25 % of US elementary school teachers are not college graduates". The effects of this situation on everyday school life and the pupils' situation is evident.

After the Sputnic-Shock had called people's attention to those grievances in 1957, suitable means were sought for making the profession of a teacher more attractive and the education of pupil's more effective. Against this background TT in USA was deprived of reform pedagogical ideas and progressive educational impetus.

In the USA TT above all was a means of abolishing the lack of teachers offering, chances of promotion bestowal of titles and improvement in teacher's salary. Thus it is not astonishing that in the American version of TT the vertical

team structure was established, which is also reflected in the titles of team-leader, senior-teacher, assistant-teacher, auxiliar teacher, student-teacher, and teachers-aide representing a hierarchic structure (cf. BRINKMANN 1973).

Advocates of progressive education of TT like L. TRUMP met with favourable response in Europe (cf. 3.1).

TT, becoming popular in this way, spread all over the USA. In 1964 about 45,000 students were instructed by teams of 1,500 teachers in total. There was a perfect bandwagon-effect which led to the replacement of carefully worked out curriculums and pedagogically evaluated developments by thoughtless practice and action. In the heydays of TT in the middle of the 60ies about 49 % of all schools were practising TT, according to the information given by NEA (comp. WEBB 1965, p. 3) if sporadic cooperation in the classroom (occasional TT) falls under TT. As may be seen from reports in literature, a great part of the lessons consisted in large group instruction, especially in social studies.

1.2 The empirical research work into TT in the USA

Occurrance of scientific and pedagogical questions of research in the Dissertations Abstracts are often a valid indicator of currency and intensity of dissemination. A simple counting of the number of dissertations about TT clearly indicates the peak of the TT-movement in the middle of the 60ies [4].

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4) The following frequencies and the figures in the following tables are taken from dissertations listed up in the Dissertational Abstracts International and Dissertations mentioned in BEGLE et al. (1975), which have not been published and which are especially concerned with TT in mathematical instructions. The figures from 1959 - 1969 were counted out manually by WINKEL (1974). The works published after 1970 are included the Psychological Abstracts under the head of TT. The figures from the 60ies and the 70ies are therefore not comparable without reservations.

Year	59	60	61	62	63	64	65	66	67	68
No.	1	1	2	3	4	3	10	13	6	6

69	70	71	72	73	74	75	76	77
8	6	1	3	2	2	2	2	-

1.2.1 Findings about learners achievement

Most of these papers deal with the central question whether TT leads to an improvement of pupils achievements. Until 1969 24 out of a total of 29 comparative studies treated this question (WINKEL 1974, p. 291). After 1969, however, only 2 out of a total of comparing self-contained-classromms and TT-educated-classrooms, treated this question. Besides the question whether TT causes a change of teacher's or pupil's mental attitude towards school or/and pupils is frequently examined. Most of the recent studies were conducted at elementary or junior high schools (e.g. from 1970 on 10 of 17).

If we do not take into consideration the investigations at elementary schools, where the differentiation of subjects is not yet fully developed, we find only very few studies of interdisciplinary TT.

To put it in a somewhat simplified way, the typical proceeding of an US-American dissertation consists of the following steps: take a school instructed by way of TT, look for a suitable school instructed by way of traditional patterns and tell teachers not to teach different subject matters in the two forms. Before and after the Time of observation test children and circumstances with well known test-batteries which afterwards can be evaluated

by the usual statistic software packages that are just accessible to you at the moment. The proceedings of a study of attitude change usually does not differ essentially from the achievement investigations.

If we continue observing some frequencies of dissertation-titles in order to get a first impression and if we count the results with reference to differences in "achievement", we may notice that a great percentage of these studies brings up no statistically significant results.

Studies up to 1970:

Number of comparisons	significant	not significant	TT better	Traditional better
57	27	31	18	9

The examinations after 1970 represent the same pattern:

Number of comparisons	significant	not significant	TT better	Traditional better
8	3	5	1	2

If we count the frequency of the results with reference to changes of opinion, we gain a slightly different pattern especially in teacher's opinions and behavior.

		Number of comparisons	significant	no differences	in favour of TT	against TT
Attitudes and behavior of students	until 1969	20	14	6	10	4
	after 1970	3	-	3	-	-
Attitudes and behavior of teachers	until 1969	16	14	2	13	1
	after 1970	3	1	2	1	-

Certainly a judgement about ways of instruction which is based on a counting-out of significant results is simply not legitimate. Nevertheless the high percentage of published results that are non-significant in connection with the comparison of pupil's achievements actually give some information, above all if you take into consideration - what is a well-known secret - that significant results are more often published than non-significant results.

Structure and results of the studies published in American scientific journals show the same pattern. We lack a detailed bibliography, especially since it is hard to determine in the pool of publications and grey literature what papers ought to be counted. In the list of literature we find the comparative empirical studies used in the survey by ARMSTRONG (1977), supplemented by articles of the last ten years which are documented in ERIC. Even here you find a great number of comparisons with non-significant results.

Does TT really not produce any effects? Are the significant results the accidental significances? Is the ambiguity of empirical findings due to mistakes in applying test-theoretical and statistics methods? Can the improvements of achievement during TT be explained by the Hawthorne-effect? This series of questions could certainly be continued. How can the confusing pattern of the empirical results be explained?

Methodical lacks are certainly evident. Non-matched experimental groups, non-random assignment (like FRAENKEL 1962), no control for the teacher's variable (even in the study by GEORGIADES and BJEKE (1966) which in general is methodical reasonable or in ZWIEBELSON, BAHNMÜLLER and LYMAN (1966) are gross mistakes. The experimental realization, especially the presentation of unusual tests to the pupils at the beginning of lessons or unusual TT-lessons with a

larger staff than usually do not exclude possible Hawthorne-effects.

However, the following aspects seem to have more fundamental significance:

a) Do the applied test-batteries (IPAT, CTPS, PTC and others) and the tests carried out by teachers cover changes of intended achievements? Besides no study goes to the heart of the question of what changes of achievement or what improvement are desired. The operationalisation in the conventional achievement tests, i.e. the formulated items, are both, criterion and measure.

b) Even if the results of the achievement tests show a definite pattern, it is impossible to give an unique interpretation, because the TT-projects, of which the results have been collected, are not comparable.

c) In most of the studies TT was practised for research purposes only for a short time, not exceeding a few months, which is due to ecnomocial strains [5].

Objection b) partly holds for particular studies as well in which pupils of TT-performance of very different conceptions are taken for a (homogeneous) random sample. Certainly measurements are not comparable that are taken in classes, whose teachers have had long TT-experience (e.g. in a school which is - as far as the technical equipment is concerned - very well provided for) with measurements taken in classes that have been educated by means of spontaneous TT at a "normal" school.

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[5] Favorable exceptions are the investigations of BAIR (1963), in the Lexington TT Program which lasted about 5 years and the study of COHEN (1976) covering a period of two years' observation.

In order to introduce TT in traditional schools it is necessary to represent a certain range of teachers and school environment. For a field analysis there is a need of certain inhomogeniousities.

Beforehand you can assume that the ununiqueness of findings in the achievement comparison of pupils in traditionally instructed and team taught classes can be clarified by introducing additional variables and by interpretating interactions between them. But in general the studies at different grades and in different subjects do not indicate any definite superiority of one of the two teaching-forms (cf. ARMSTRONG 1977, WINKEL 1974). According to BEGLE (1975) if at all it is in mathematical instruction that a slight superiority of conventional teaching might be perceived in the results of the studies.

It is often argued against empirical research that the statistical analysis only gives report on the mean-score of achievement usually. Particularly at school a simple comparison of class means of achievement is very insufficient. Although there are suitable statistical methods to get more information about the effect of change in distribution than mean comparisons, investigations did not make use of them. Consequently there are no results of comparison of different aspects of achievement-curves which could be reported.

The findings of studies comparing students' attitudes are very similar.

1.2.2 Changes in the teacher's role in TT

Definitely TT causes changes in teacher's job attitude/ behaviour most frequently. If US-American dissertations until 1970 are taken as basic set again, then only 4 out of 17 studies brought up non-significant results. The remaining 14 findings 13 times showed a definitely positive

effect due to TT (WINKEL 1974, p. 293). After 1970 the study of ANFIN (1975) reported an improvement of attitude towards TT with increasing knowledge and experience of TT.

The proceedings of the investigations very much resemble those of the dissertations on achievement comparisons. Standard tests were taken (like the Minnesota Teachers Attitude Inventory, cf. BRASHEARS 1971, FOGELBERG 1973, the F-scale etc.) in which the evaluation of attitudes depends on criteria provided by the test-manual but not by criteria derived from a theoretical concept of attitude desired for TT-teachers.

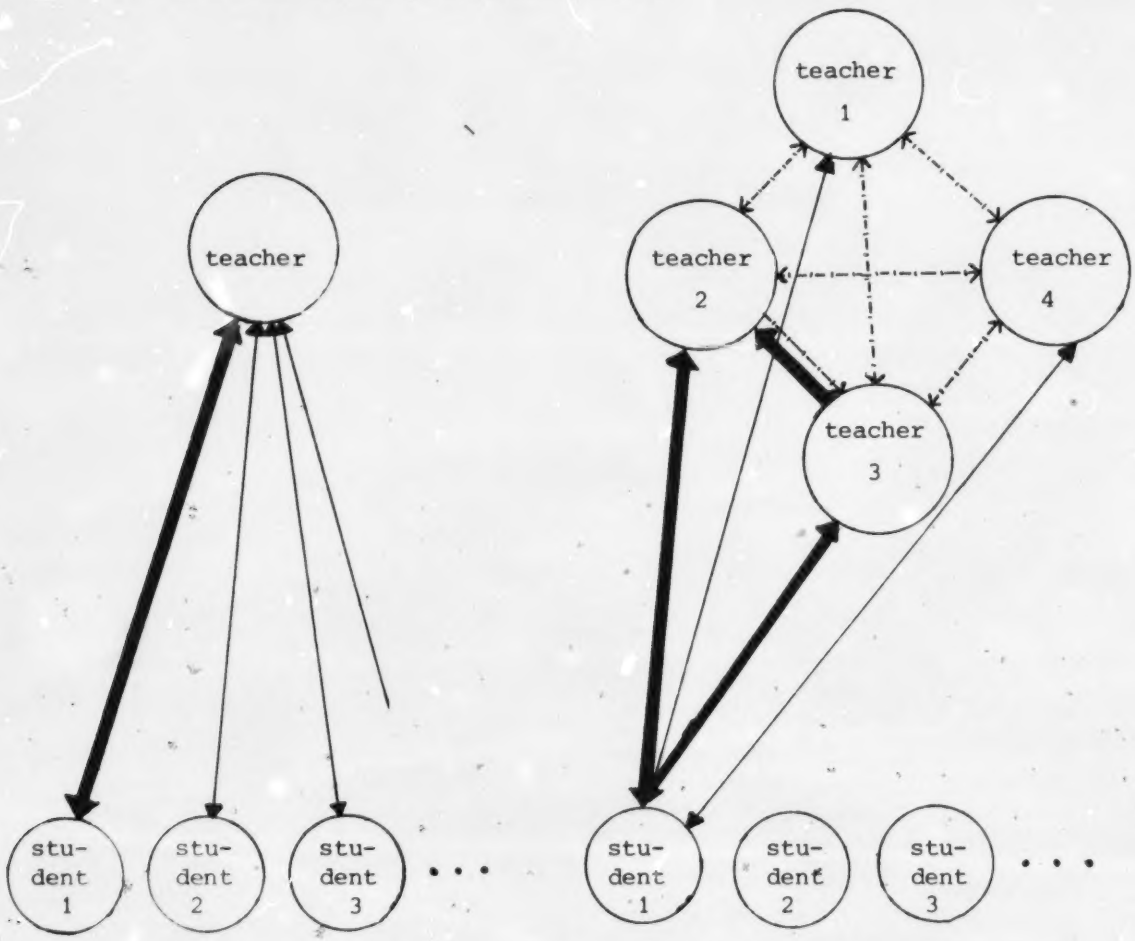
RHODES (1971), COHEN (1976), HALL and RUTHERFORD (1976) were also able to show improvement in attitudes/behaviour by TT experience. Therefore the proposition: TT causes most intensive changes in teacher's role compared with both changes of students attitudes and achievement at least seems to be statistically supported.

This proposition becomes plausible if you consider the changed structure of communication, demands, duties and abilities of a TT-teacher. While in the traditional, self-contained classroom-instruction there is a hierarchy with a single teacher on top, the teacher in TT is embedded in a group structure (cf. figure 1). At least in horizontal structured teams each teacher has to adjust himself and cannot enforce his intentions because of his position. There is also the possibility of the teacher's authority declining by the fact that pupils may win other teachers for their interests and demands or that they may partly evade the dependence on one teacher by orienting towards another one (cf. figure 1). One might suppose that the team-ties prevent a single teacher from pushing through his interests towards the pupil, towards other teachers and the headmaster as well. But these assumptions seem not to be confirmed, on the opposite:

"What we had not expected were reports that team teacher felt an increased sense of individual autonomy and influence in the school as a whole." (COHEN 1976, p. 3)

This statement was also confirmed by JOHNSON (1976).

Figure 1: Teacher-student interaction in self-contained classroom (a) and team-teaching instruction (b)



For intensive cooperation in a team, several abilities are needed; ability of cooperation, of criticism, ability of bearing frustration, and of working in a group are abilities of a TT-teacher most frequently mentioned in literature. The willingness to spend additional work at school, enthusiasm, and self discipline are also qualities that are

often mentioned in teacher inquiries which are supposed to be important for TT (cf. BORG and BRITE 1967).

Some investigations emphasize on the importance of other personality and further differentiating factors for TT (i.e. CHARLTON 1970, WYLIE 1976, AHERN 1971). However, until now one cannot draw any conclusion as far as the translation of TT into practice is concerned.

1.2.3 Team cohesion

Even if the teacher's satisfaction in and the self-assessed efficiency of his work on the average are greater than in conventional instruction, a team is rather a very unstable framework:

"when the price of joint activities becomes too high the team drops down to lower level of interdependence or dissolves all together"

as COHEN (1974, p. 2) infers from her two year's investigation in 79 schools in the southwest of the USA. Teams with uttermost intensity of interdependence within the team and high percentage of joint teaching were especially unstable. Teams which were too big (4-6) were also likely to dissolve and had nearly disappeared at the end of COHEN's study.

Other findings relevant to the practice of teaching can be taken from the study of ARIKADO (1973). This study clearly demonstrates that members of team without leader are more satisfied and that the uneasiness about their situation positively correlates with perceived similarity between their own and the leader's personal characteristics (cf. BORG and BRITE 1967). Another influencing factor for teacher's satisfaction is the balance of a team (ARIKADO 1973). HALL and RUTHERFORD found out that a period in which team members are concerned with stabilization precedes the

period in which positive results are obtained. The former process can be expected to take about three years (cf. COHEN 1974).

1.3 Current developments

After the bandwagon effect disappeared in the 60ies and after the wave of publications concerned with the question of whether TT is able to render instruction of children faster, easier and cheaper and after the results generated a clear disillusion, many teachers returned to traditional instruction following 'input-output philosophy'.

But there remained a small percentage of teachers, convinced of the necessarities of cooperation and the advantages of TT. Thus TT "has spread across grade levels to become a fixture of the American educationa s scene" (ARMSTRONG 1977, p. 65). The averting of this group of teachers from pure input-output-optimazilation in the meaning described above, let us look forward to current TT practice approaching to its original 'reform pedagogic', 'progressive educational' intentions.

But there are only very few organized projects practising team-teaching today. One of them is the individual guided education (IGE) project, which, however, has been developed only for elementary school up to now. Today about 100 schools follow the concept elaborated by KLAUSMEIER and coworkers (cf. KLAUSMEIER et al. 1977). The aims and some of the purposes of IGE organization are described in the following quotations:

"In IGE, horizontal and vertical administrative-organizational arrangements have been established that facilitate role clarification and work allocation by the staff of the school. As the instructional staff is organized in cooperative teams, who, in turn, plan and carry out instruction of multiaged groups of students." (KLAUSMEIER et al. 1977, p. 7)

Although "there is a heartening communality among the practices adressed by the data gathered from IGE Schools" (ARMSTRONG 1977, p. 69) there is lack of research that is both systematic and comparative. Therefore we cannot give a final evaluation of this project. ROMBERG (1977) reports on some remarkable success of instruction in the first six years at elementary school. Within IGE there are a number of aims which might go beyond pure efficiency and effectivity including above all child-oriented motivation. On the other hand, however, there seems to be a strong tendency to overstress the scheduling of lessons especially in mathematics.

Another project, more in the technological tradition, is the research project: Management Implication of TT (MITT) (PACKART et al. 1976, SCHMUCK et al. 1977, CHARLES et al. 1976). In addition to the essential problem of long term effects of TT, the project examines mainly the environmental, equipmental and organizational necessities and implications of TT. These are important aspects, especially as many TT-teams have a spontaneous beginning; teachers just decide to cooperate and do some instruction together (COHEN 1976) without the school equipment being adjusted to the changed form of instruction and small group work etc.

Starting TT in that way, the lack of ability of communication, (MARTIN 1975), of organisational skills and know-how of composing teams, is not surprising (NOLAN 1976). Therefore elementary aides - e.g. how to prepare the agenda of team meetings (GODDAN 1975) are helpful and important, but the development and the history of TT in the USA clearly indicates, that it is more urgent to develop conceptualizations of teachers' cooperation and TT that are not so much based on technological arguments than before (p. 6).

2. *TT in the FRG*

2.1 Conditions of educational reforms and innovations after World War II

Reconstruction and Reform of school after World War II in the FRG started by re-establishing the three-levelled school-system of the Weimar Republic (1919-1933). Thereby the most urgent task was to build up a working school as fast as possible.

Progressive and democratic forces at school that had survived were mainly preoccupied with clearing school and school-books of fascist contents. In mathematics and science school books clearly military examples and applications were cancelled. Ideas critical of the organisation of instruction e.g. frontal instruction, could not overcome. As the public was even not open-minded to problems of school reform, there was no chance for more radical ideas or large-scale innovations (cf. BRINKMANN 1973, p. 71). The realized shortage of qualified manpower, caused by neglected education, at that time could still easily be filled by workers from the GDR or eastern parts (cf. NEANDER 1974, p. 57f). Thus a traditional, very technological school organisation was developed with the "teacher perceiving his own role in a way that contradicted all forms of cooperative instructions" [6].

Neither was at that time any attention payed to the discussion on school education abroad. Presumably caused by the increasing activities in the USA following the sputnic shock some people in the FRG clearly realized the necessity of essential innovation exceeding administrative measures, i.e. doubling the volume of secondary schools and univer-

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6) BRINKMANN talks about a "Rollenverständnis der Lehrer, das allen Formen kooperativen Unterrichts entgegenwirkte", (BRINKMANN 1973, p. 75).

sities, if one wanted to prevent a "Bildungskatastrophe" (educational disaster). In that connection TT was discussed in FRG to a greater extent. In 1966/67 the first experiment of practising TT was finally carried out at the Johannes-Scharrer-Gymnasium at Nuremberg.

2.2 Extension and characteristics of TT in the FRG

At the end of the 60ies TT was more frequently discussed in public, yet the first books about TT were not published before the beginning of the 70ies (MEYER 1971, DECHERT 1972, BRINKMANN 1973 and WINKEL 1974). There were only a modest number of TT-projects carried out at school. In 1971 DECHERT conducted an inquiry at the ministeries of education in the different federal states of the FRG asking for schools practising TT. The list consisted of 84 schools, a figure that, however, was overstated, as many schools planned for TT did not realize it in the end (WINKEL 1974, p. 25).

Another inquiry at the ministeries and a revision of DECHERT's list by WINKEL (1972) found out only 24 schools all over the FRG practising TT at that time. With a total of 30,000 schools in the FRG these are less than 0.1 %. WINKEL's survey stated that only one team was organized hierarchically and that 70.9 % of the teams were discipline teams. The percentage of TT-teams in mathematics amounted to 14 % (16 of 114 registered teams), surprisingly close to the percentage of teams in social studies. The numbers, however, are only of limited value, since the teams worked at various types of schools (2 elementary schools, 9 secondary schools and 13 comprehensive schools). Nevertheless, they represent the only known data set about the practice of TT. Even if some schools were not registered in that study, we can assume that the number of schools not included is not very high because of the careful procedure of WINKEL. Furthermore we can assume that most of the schools not included, practised only sporadic TT if at all.

Although we have no reliable data that would permit any direct comparison we may notice a break in the TT movement around 1974, which is reflected in the frequency of theoretical articles on TT.

The fact that - with the exception of the municipal state of Hamburg - none of the 10 federal states even mentions TT as a form of instruction in the guidelines and laws for the 'Neugestaltete gymnasiale Oberstufe' (the revised type of the upper secondary education) also indicates that TT is not a generally accepted and practised form of instruction. In the "Richtlinien für das Vorsemester und die Studienstufe der gymnasialen Oberstufe" (1973, 1974, 1976; Ministerial Instructions for teaching in the 11-th grade) TT in Hamburg is at least considered as a desired form of instruction. A further indicator of the relative insignificance of TT in actual school life in West-Germany is the fact that the discussion about TT is not at all resumed in connection with the controversy about comprehensive schools. At any rate only one municipal state tries to collect certain experience by practice of TT. This may be due to the fact that Hamburg as educational department conducted a TT-survey, financed among others by the Ministery of Education in Bonn.

2.3 Empirical research on TT in the FRG

With the traditional German pedagogical research being oriented towards the humanities and this implying the rejection of controlled variable-orientated empirical research it is by no means surprising that we hardly find any empirical investigation on TT.

The study of MEYER and coworkers (1971) [7] conducted at

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[7] This was the only German survey attempting the application of empirical methods that could be found in literature.

the 'Grund- und Hauptschule Obrigheim' is an exception. However, the nature of this study is that of a pilot study. There were only few months of observation and the team was rather unexperienced [8]. Following the proceedings of American investigations, the experiment made a comparison between achievement of team taught students and students self-contained classroom instructed. This achievement comparison was made one year after the termination of the TT-experiment. Students were given a story and asked to retell it. As the story focussed on the reciprocity of aids, the measured achievement represents a particular aspect of attitude/social perception as well. Thus, the result of the achievement comparison which stated a superiority of team-taught students can only be interpreted with reservations.

In an explorative study SEHRINGER and SEHNBERT (1971) investigated into aspects of field change during that TT-experiment. They got several hints that the dynamics of TT causes a lot of changes in the social behavior of teacher and pupils (sociogram comparison), and in teacher-pupil relations (status indixes) at least in the beginning of the TT-experiment.

2.4 *Problems of acceptance and performance of TT and current developments*

In section 2.1 it is described that TT in the FRG was discussed to a larger extent when the 'TT-movement' in the USA had passed its climax. Furthermore it had already been found out that - compared with conventional instruction - TT was not clearly superior.

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8) In addition to 4 teachers with an experience of less than half a year, 7 student teachers participated in the experiment with 63 pupils.

In the FRG TT was discussed and supported by more 'progressive circles' (as well as in other countries), which were interested in changing and improving existing structures, e.g. those of instruction. However, since the USA had lost much of their reputation in these circles in Germany, because of their disastrous engagement in Vietnam, we may suppose that the very *term* of 'Team Teaching' which has been adopted into the German language from the American was met wich resentment and hence played a certain part in preventing a larger dissemination of TT (cf. WINKEL 1973, p. 220).

Decisive factors for the very limited acceptance and dissemination of TT may certainly be seen in the role of a teacher as it has been seen by the German educational administration and in the inflexibility of the latter. As achievement in this context has been interpreted as individual achievement and mainly as a means of professional promotion, TT did not agree with some of these principles.

- As preparation and partly instruction itself is made collectively, the single teacher cannot put the success and improvement completely to his own account.
- Conventially the teacher is the controller of the student, in TT-instruction he at least partly has to put up with control by his colleagues, if his preparation is inadequate he has to be afraid to more than just a bad conscience.
- TT demands adjustment and coordination with colleagues, the essential decision competence is given to the team. While in self-contained classroom instruction the single teacher may choose the series of disciplinary measures without being forced to give any account to an adult, he may be obliged to give reasons for his steps when practising TT (WELLENDORF 1968, p. 22).

Furthermore we may suppose that there are lots of potential sources of conflict in TT, e.g. teachers may be afraid of additional work they have to do textbooks and environment at school are fitted for frontal instruction and not for TT, for instance there even is not a single mathematical school book which could be used for learning in small groups. It is the teacher himself who has to produce suitable material.

TT demands the commited teacher, the professional educationalist. Yet he cannot do too much without getting the necessary minimal resources, i.e. working material, rooms, etc. from the administration. A certain extent of liberty in the curriculum is needed as well, which the teacher could fall back into if the occasion demands. Unless these conditions are granted the advantages of TT cannot shine up, e.g.: the improvement of instruction resulting from division of labour; improvement in the preparation of working material and booklets; qualified evaluations and detailed discussions in the team, adjustment of students' grouping to subject needs.

In the present framework of educational conditions a successful practise of TT is hardly possible. In some of the states even at secondary school level there is a given legel limit of 39 students per teacher. In reality the teacher pupil ratio is even worse sometimes. For, inspite of opposite assertions by the government, there is a teacher shortage in the FRG. These are conditions, which must be and can be changed before practise of TT could be rendered possible.

Teachers are willing to perform TT and are able to solve the problems inherent in TT once they are given a certain amount of support. In the FRG this is clearly shown by the examples of Hamburg and the practise at the "Team-Kleingruppen-Modell" (Team-small-group-model) in Köln-Holweide,

Göttingen and Hannover-Linden. The willingness of Hamburg and the possibility to participate in a Central-Fund for TT, made it possible that school were financially supported when practising TT and thus several schools in Hamburg have practised TT for the considerable period of five years. Yet the differences in practice seemed to be rather high. A more detailed evaluation of the experience of TT made at Hamburg schools may be expected with suspense.

The Team-Kleingruppenmodell introduced by GGG (1978) and BRANDT and LIEBAU (1978) can be called interdisciplinary TT with some right. As its organizational arrangement is fascinatingly simple it will be briefly described here.

A nonchanging group of 5-6 teachers are assigned to a large group of 90-100 students. The team of teachers have to give all lessons/instruction (including substitution caused by illness of teachers). Following a small group principle within the large group any small groups are to be heterogeneous according to sex and achievement. Instruction is given in large groups for a small percentage of the total instructional time, in varying combinations of several small groups at other times, and to the small groups for the remainder. Occasionally the students learn in a silentium. There is a two level achievement differentiation, for instance in mathematics this can consist of giving two different but related item-sheets to the children [9], or again, low-achievers can have special instruction while high achievers solve additional items in the silentium or often help other teachers prepare their next lessons. Teachers' Teams are embedded in a school-organisation that is fitted to the model, i.e. members of

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9) It is intended that each pupil at each moment can choose which level he is joining. For a more detailed discussion compare GGG (1978) and BAUERSFELD (1978).

different teams cooperate in a PPD (Educational-Psychological-Service) workshop and other workshops for problems of special subjects.

Certainly, there are problems [10] in practising the model. However, the experience reported in the literature is sufficiently encouraging to predict some posivite results, provided, the experiment is not stopped by politicians.

3. Reformpedagogic variants of TT; TT in Sweden and Great-Britain

3.1 The Character and development of TT in Sweden and GB

The longest continous experience of TT was made in some schools in Southern Sweden, I suppose. In the beginning there were practical problems at school. In a school-experiment that started in 1958 teachers had to teach their students under the general aim of learning 'Current Orientation with world wide perspectives' (BRINKMANN 1973, p. 40). The teacher of Føgelback School in Malmö, at which the experiment was conducted, recognized that only continous cooperation with didactical and methodical revision of plans, gave them the chance of success in their task. After rather an accidental and less theoretically systematized beginning, the acquaintaince with the papers of L. TRUMP led to a desired theoretical identification and to the foundation of the Trump Committee in 1963.

In 1964, the Swedish parliament decided that in Malmö and few other places educational development centers were to be established. Within the Malmö region center the 'Varying Group Size and TT Project' (VGT) grew out of the Trump

10) As in all TT-models teachers input is higher than in self-contained classroom instruction if a comparable teacher-student relation shall be realized, the size of teams is tempting for fractionizing, but this is not the place to discuss the model in details.

committee. Colaborating with the Malmö school of education, especially BJERSTEDT, GRAU, RUDVALL and coworkers built up a center in which for some time more than 120 researchers - mainly financed by short-term contracts/grants - even exploring and practising innovations. Up to now, there have been published several hundreds of papers and research reports, i.e. the series 'Pedagogisk-psykologiska problem' has already more than 200 volumes. Unfortunately most of the papers are available only in Swedish, but the book by TESCHNER (1972a) and the papers by BJERSTEDT (1974) and RUDVALL (1978) give a good review of the broad range of educational and pedagogical tasks investigated in the center and published in German or English respectively.

An important feature in the process of research and innovations is, "that collaboration between state, central and municipal/regional authorities" in Malmö "has functioned in a complicated interaction of mutual influence." (RUDVALL 1978, p. 236). Another important factor for the realization of TT was the collaboration between architects, teachers, politicians and other experts for the construction and development of open space schools (SAMSKAP). It should be noted that especially the SAMSKAP-project was critized in the public media in a rather derogatory manner, which, however, did not essentially prevent a continuous development.

Beside the introduction of TT in SAMSKAP-schools research also focussed on the introduction of TT in traditional schools.

The methodical principle of the VGT experiment consisted of summarizing groups of subjects under project-like titles. Similar to the "Team-Kleingruppen-Modell" the teachers of 3 classes including some specialist teachers built the teachers' team. However, there were some diffi-

culties in adopting the model at secondary level [11] (cf. TESCHNER 1972, p. 272f).

At least literature states that it was difficult to follow this principle in mathematics instruction. The IMU (Individualized Mathematics Instruction) Program, which was planned for 7th grade upwards, was developed simultaneously and tested in SAMSKAP-schools, too. The IMU-program was officially introduced optionally in all schools all over Sweden in 1968, however, was controversially discussed from the beginning [12]. The IMU-program is a model of a completely individualized, programmed instruction. Indeed this form of learning contradicts TT in its practice and aims. The IMU-program was stopped [13] in 1972.

A most precise and representative summary of the aims of VGT, the role of research and the claims on research is given by BJERSTEDT (1974, p. 4).

> To endeavour to increase the possibilities of realizing the aim of the school to combine individualized teaching with social training, by making use of varying sizes of groups and team teaching;
> to provide a practical design for the external conditions for the use of VGT, at various levels of the school, with regard to the organisation of work, working methods, teaching materials, personnel structure, premises, costs, etc.;
> to carry out within certain spheres of the VGT activity, a scientifically cogent analysis and definition of the aims, as well as to evaluate the effects of the VGT methods, and in this context
> to construct suitable instruments for evaluation.

Similar to Sweden, the origin of TT in GB - compared with the USA - was more closely orientated towards the conception of progressive education. This is clearly reflected

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11) Originally the VGT-project was planned for the 7-9 grade of compulsory school.

12) Following BJERSTEDT the main reasons for the introduction were not based on educational consideration (TESCHNER 1972, p. 103f).

13) It was replaced by a less rigorous program 'hej Mathematic' in 1972.

in WARWICK's definition (cf. p. 2). In an elaborated analysis WINKEL (1974, p. 151-201) pointed out that besides the progressive tradition

- the Newsom Report (1963) that recommended to give aids for handicapped students by means of TT

and the

- critics of streaming, the most rigorous English version of achievement differentiating at school

were the most important stimuli for TT in GB.

But the following aspects played a role, too

- Abolishing departmentalization with the aim of pointing out to the multitude of connections between subjects which are cut off in traditional school sometimes in a highly artificial manner.
- TT as vehicle to utilize different media in a professional manner, which is impossible for a single teacher.

Unlike the development in the USA, TT in GB was neither influenced by economical factors nor by aspects of teachers' status or career, e.g. longing for titles. This is underlined by RICHMOND (1976, p. 67).

> "It must be stressed that that conditions which have given rise to the team-teaching movement in the USA in recent years are very different from those prevailing in British schools, and that for this reason alone it is extremely unlikely that comparable developments in this country will follow the emergent American pattern."

3.2 Scientific investigations accompanying TT

Soon after starting TT in Sweden it was demanded to evaluate TT and other innovations tested at schools. As the VGT-experiment was conducted by teachers and members of administration with theoretical and practical competence, but without specified research competence there were great

initial difficulties to fulfill this demand. Especially the VGT project is marked by a permanent process of renewing and changing which, as everybody knows, renders controlled experimental analysis almost impossible. As innovations and variations, i.e. school environments, curriculum, composition of groups, scheduling, were introduced uncontrolled and unplanned - in particular no comparative statistical analysis could be carried out.

The latter accounts for the very limited range of the possible interpretation of the results. The first evaluation reported by RUDVALL (1971) nevertheless indicated several expected and unexpected findings such as:

- rising of teachers level of ambition
- increased utilization of school resources by teachers
- more subject orientated and intensive preparation in the teachers team, etc.

Most important disadvantages of TT found in the investigations are

- discontents following team-conflicts
- overrating of teachers ability in team organisation and leading
- increased stress.

These results are not that embarassing and are known from the American empirical studies, too. More serious are the findings of RUDVALL 'that one failed to reach one central aim': in VGL organized schools social contacts between students decreased. More recent investigations with traditional experimental designs did not indicate any great change in VGL compared with self-contained classroom-instruction.

Subsequent to these unsatisfactory results of traditional comparative empirical research, which are partially due to

inadequate designs and methods applied in the investigations quoted above.

"A changed attitude to how research should be carried out also emerged. Criticism was levelled a continued onesided use of quantitative methods to find differences between the various ways of teaching. More interest was shown in investigating the process more closely than in studying results that were difficult to relate to the underlying influence." (RUDVALL 1978, p. 234)

Certainly, this new approach is marked by important features of action research, as can be seen from the following quotation.

"This type of research, with active participation in the planning and activities of the school is characterized as a problem solving model. The scope is deliberately limited from what is usually called action research. In the latter model the researcher's own priorities, values and efforts to realized them in the practical work in which they participate are allowed to play a greater role." (RUDVALL 1978, p. 235)

Traditional experimental and empirical research results in a subject-object-relationship without any active participation of the teacher (the subject) in the process of research and in defining the research problem (cf. fig. 2a). Action research, conversely, leads to a subject-subject - relationship, which, in practice, frequently entails an undifferentiated fusing of scientific and practical work which is inappropriate to the objects of practical and scientific work as well (see BROMME et al. 1978). According to the principles of action research, the scientist, just like the practical worker (the teacher) is almost exclusively occupied with solving (special) practical problems. A further important feature of action research is that researchers and teachers will cooperate over an extended period (cf. fig. 2b). RUDVALL's conception seems to be a synthesis of these two research models. The conception proposed by him can be interpreted as a loop model (cf. fig. 3). Stages of intense cooperation, communication, problem definition, and feedback alternate with stages

of separate work. For reasons of research methodology, too, the temporary division of theoretical and practical work among different individuals turns out to be indispensible, for instance when dealing with questions of classroom research, as the observers have to make sure that the observed are not completely informed.

fig. 2a)

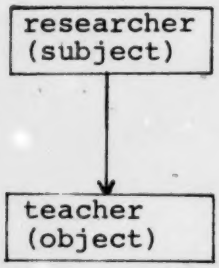
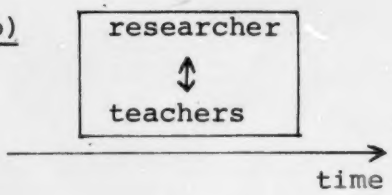
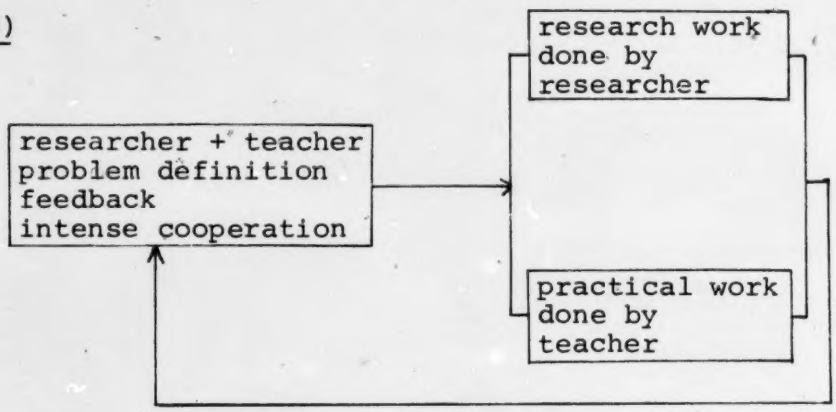


fig. 2b)



Relationship between researcher and teacher in a) the traditional pattern of research b) in action research.

fig. 3)



Interpretation of RUDVALL's proposal of relationship of practical and research work.

4. *Summary*

History of TT as well as research on it clearly proves that TT only promises a successful practice if it is linked up to more comprehensive pedagogic conception, i.e. project orientated instruction. Taken as a mere organisatorial means TT is insufficient. As reports on TT show that the prospects of continuous work are particularly restricted for teams formed spontaneously without additional resources, and for teams with the range of interaction too wide and with a team structure not adequately balanced.

As for attitudes and actual conduct TT - when it is performed - causes a great number of changes on the teacher's part. Considering the students, changes are less severe and furthermore we cannot classify them definitely as positive or negative.

Research only provides very unsatisfying results as far as the question of achievement changes is concerned. If we look at the multitude of achievement comparisons in 'self-contained subject matter' there is no clear superiority nor inferiority of TT in any particular subject.

We should, however, ask ourselves if the school of today must not cope with certain tasks caused by the changing demands for occupational or general qualifications that a single teacher cannot solve. In particular the discussion of more open topics gives hints to clear cut boundaries for the educational practice of discipline teaching. This problem can be solved by the cooperation of different subjects. Thus it is not at all surprising that the experience of TT is the best in interdisciplinary projects.

For various reasons mathematics imposes a number of specific problems, i.e. mathematics may soon be getting too complicated for pupils if the topic is 'open' to a certain extend.

Furthermore the teacher of mathematics is - as a rule - not prepared for controlling dynamic processes involved in the discussion of more open problems; neither is he able to recognize potential elementary ways of solution. Text-books and teaching aids available are not so much helpful at the moment.

The research on TT has not yet given a definite answer to the essential question for school-practice: what teaching units can be taught in what form by what teaching team. Any empirical research that would be guided by this particular question would step on new ground.

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